IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Patent Application No. 10/668,451

Applicant: Williams et al.

Filed: September 22, 2003

TC/AU: 3736

Examiner: Hoekstra, Jeffrey G.

Docket No.: 229278

Customer No.: 23460

APPELLANTS' APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In support of the appeal from the final rejection dated July 31, 2006, Appellants now submit their Brief.

Real Party In Interest

The patent application that is the subject of this appeal is assigned to Volcano Corporation.

Related Appeals and Interferences

There are no appeals or interferences that are related to this appeal.

Status of Claims

Claims 1-20 stand finally rejected, and these rejections are presently being appealed.

A complete listing of these claims appears in the Claims Appendix.

Status of Amendments

There were no amendments submitted after the final rejection.

Summary of Claimed Subject Matter

Claims 1-20, including independent claims 1 and 12 are pending. The summaries of the independent claims reference the specification and drawings filed with the application on September 22, 2003.

Independent claims 1 and 12 pertain to a sensor catheter assembly (see, generally FIG. 2). The catheter assembly includes a catheter 12. A proximal end of the catheter 12 is adapted to be coupled to a processing unit 14. A sensor assembly 16 is disposed at a distal end of the catheter 12. A plurality of wires 18 carry signals, coupled to the sensor assembly 16, carry signals along the length of the catheter 12.

Turning to the examples illustratively depicted in FIGs. 4, 5 and 6, the plurality of wires 18 connected to the sensor assembly 16 are divided into at least first and second wire bundles (e.g., 24 and 26) to reduce electromagnetic interference (e.g., cross-talk) between the signals carried by the sets of signals carried by the wire bundles that carry control signals to the sensor assembly 16 and sensor signals from the sensor assembly (see, page 5, lines 9-25).

Independent claim 12 is similar to claim 1. However, the recited catheter is replaced by the more general "flexible elongate member" term.

Grounds of Rejection to be reviewed on Appeal

The grounds of rejection to be reviewed on appeal are the grounds stated in the Final Office Action mailed on July 31, 2006. In particular, Appellants appeal:

(1) the rejection of claims 1-4, 7-9, 12-14 and 17-19 as being obvious over Ferrera U.S. Patent No. 6,168,570 (the Ferrera '570 patent) in view of Osadchy et al. U.S. Patent No. 6,266,551 (the Osadchy '551 patent).

(2) the rejection of claims 5, 6, 9, 10, 11, 15, 16, and 20 under 35 U.S.C. Section 103(a) as being obvious over the Ferrera '570 patent in view of Danisch et al. U.S. Patent No. 6,563,107 (the Danisch '107 patent).

Argument

The issues to be resolved on Appeal can, in fact, be boiled down to a fundamental question. Do the teachings of Osadchy sufficiently suggestion modifying Ferrera's catheter in a way that renders Appellants' presently claimed invention? In particular, does Osadchy properly suggest to one skilled in the art at the time of the invention to modify Ferrera's twisted wire bundle (intended for structural integrity) to include multiple "bi-directional" *control* and sensor signals, divided into first and second wire bundles coupled to a distally mounted sensor assembly? For the reasons set forth herein below, Appellants submit that such suggestion does not exist, the Final Office Action has not established a *prima facie* case of obviousness, and therefore the obviousness rejection of claims 1-20 should be reversed.

Rejection of Claims 1-4, 7-9, 12-14 and 17-19 over Ferrera in view of Osadchy

Claims 1-4, 7, 9, 12-14, 17 and 19

Appellants submit that the Final Office Action's rejection of independent claims 1 and 12 as obvious over Ferrera in view of Osadchy is in error. In particular, the recited invention is not obvious since Osadchy does not suggest, to one skilled in the art at the time of the invention, the following:

(1) modifying Ferrera's catheter to include multiple wires coupled to a single sensor assembly,

(2) that such multiple wires are in turn grouped into first and second twisted wire bundles, and

(3) the signal wires carry control signals to, and sensor signals from the sensor assembly.

In fact, Osadchy does not even disclose the third distinct aspect ("control signals transmitted to the sensor assembly"), since the twisted wires disclosed in Osadchy contain only analog closed-loop *sensor* signals.

Appellants' Claimed Invention

Appellants previously amended independent claims 1 and 12 to make clear that the plurality of wires, grouped into at least first and second wire bundles and coupled to the catheter's distally mounted sensor assembly, carry both sensor *and control* signals. The control signals are transmitted to the sensor assembly and the sensor signals are transmitted from the sensor assembly when the sensor catheter is utilized in its intended operational environment. Thus, as recited in each of the independent claims, wires from both the first and second bundles are coupled to the sensor assembly to support bi-directional sensor data *and control signal* transmissions along the plurality of wires.

The Cited Prior Art

Ferrera discloses a catheter assembly structure including a micro-cable 10 that is insertable within a catheter. The micro-cable 10 can indeed comprise a set of bundled, twisted elements (see, e.g., FIG. 15). Ferrera discloses, at column 8, lines 39-43, that the micro-cable 10 can comprise multiple strands to provide desired bending and strength characteristics. Ferrera notes in passing, at col. 9, lines 39-45, that the micro-cable can be a composite cable that includes a sensing element. The Ferrera '570 patent even identifies a variety of sensing elements carried by the micro-cable. However, Ferrera is silent with regard to the arrangement of wires (if any) that connect to the sensor elements.

Osadchy is directed to a catheter device that includes a position sensor disposed at the distal end. When subjected to an external magnetic field, a current is induced in coils of the sensor that enable determination of the catheter tip's position in a magnetic field. See, column 11, lines 31-49. The twisted pair wires 72 are solely sensor wires. Nowhere does Osadchy disclose control signals being transmitted to the sensors at the distal tip of the catheter.

The non-obviousness of the claims over the teachings of Ferrera and Osadchy

Independent claims 1 and 12 are not rendered obvious by the combined teachings of Ferrera and Osadchy because the combined teachings of the two references do not fairly suggest the presently claimed invention.

Ferrera fails to disclose several elements of independent claims 1 and 12. The Ferrera '570 patent does not disclose, as the Final Office Action readily admits, (1) dividing the plurality of wires into first and second wire bundles wherein the wires of each bundle are twisted together to reduce interference between the wires of the plurality of wires, and (2) the wires carry control signals to the sensor assembly and sensor signals from the sensor assembly. Furthermore, Ferrera does not disclose "a plurality of wires coupled to the sensor assembly." The multiple wires in Ferrera are intended to provide flexibility (see, e.g., col. 8, lines 39-43). The primary example does not even carry an electronic data signal. To the extent that Ferrera discloses a sensor, it does not state that multiple signal wires are connected to the sensor assembly.

Beyond not disclosing electromagnetic interference reduction, Ferrera in fact, discloses twisted cable bundles comprising many strands that would tend to increase, rather than decrease, the presence of interference through the transmission of differing signals on parallel paths within the single twisted wire bundle. Such explicit disclosure of interference-inducing wiring arrangements strongly suggests that the catheter in Ferrera is intended to be used to carry only a single signal, if any, at any time. Under such circumstances there is no need to implement Appellants' claimed invention that includes at least a first and a second wire bundle.

Furthermore, Ferrera does not disclose a "sensor catheter" as recited in claims 1 and 12. Appellants' claimed invention is directed to a sensor catheter that includes a sensor assembly and the recited plurality of wires. In contrast, Ferrera discloses a micro-cable that is fed within a separate and distinct "micro-catheter." Thus, to the extent that a sensor is disclosed by Ferrera, such sensor is mounted upon the disclosed micro-cable rather than a catheter (as recited in the claims).

Appellants agree that Osadchy does indeed disclose use of a twisted pair arrangement to enhance signal interference immunity. However, Appellants are unaware of any such appreciation of the beneficial effects of bundling signal wires to enhance signal interference immunity in the context of the presently claimed invention where a set of wires associated with a sensor are divided into multiple bundles of twisted wires providing bi-directional data signal paths between the sensor assembly and a connected processor that include: (1) control signals transmitted to the sensor assembly, and (2) sensor signals transmitted from the sensor assembly.

The twisted-pair wires referred to in column 11 of Osadchy are only *sensor signals* comprising three closed loop windings around a magnetic core that facilitate determining a position of a catheter tip within a magnetic field. Nowhere does Osadchy disclose a *control signal* being transmitted on the twisted pair lines.

In view of the above, Appellants submit that their presently claimed catheter device is not suggested by the combined teachings of Ferrera and Osadchy. As noted previously herein above, the Ferrera patent does not suggest a need to "reduce electromagnetic interference between the wires" of its micro-cable. Nor does Ferrera even suggest the potential presence of multiple, potentially interfering signal lines in its micro-cable. In fact, the twisting of a large number of strands together in the various embodiments, while achieving Ferrera's intended purpose of providing a sturdy, yet flexible, cable, actually increases the risk of signal line interference. Thus, there is no suggestion to incorporate the twisted wire arrangement disclosed in Osadchy into Ferrera's micro-cable.

Furthermore, even incorporating Osadchy's twisted pair sensor lines into Ferrera does not render the presently claimed invention. As noted above, the claimed invention is directed to a catheter wherein wires carry control signals to a sensor assembly and carry sensor signals from the sensor assembly. In contrast, Osadchy discloses only sensor signals (associated with a magnet-based sensor array) that are induced by an externally applied changing magnetic field. Osadchy does not disclose or even remotely suggest *control signals* being transmitted on the lines that are in need of protection from potential magnetic field interference.

Appellants traverse the anticipation rejection of claims 2-4, 7-9, 13, 14, and 17-19 for at least the reasons set forth above.

Claims 8 and 18

Appellants submit that Ferrera does not disclose that the third bundle *consists* of three wires as recited in claim 8 and 18. This recited element has not been identified in the Final Office Action. In the event the rejection is not withdrawn, Appellants request identification of the recited grouping arrangement of claims 8 and 18 in the cited prior art upon which the Final Office Action relies.

Rejection of Claims 5, 6, 9, 10, 15, 16, and 20 over Ferrera in view of Danisch

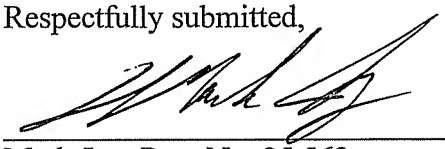
Appellants traverse the rejection of claims 5, 6, (9?), 10, (11?), 15, 16, and 20 over Ferrera in view of Danisch. As an initial matter, Appellants believe the Final Office Action intended to identify claim 11 rather than claim 9 in its rejection. Furthermore, this rejection should be over at least the combination of Ferrera in view of *Osadchy* and Danisch in view of the revised grounds for the rejection of claims 1 and 12 to which each of these dependent claims refer. Appellants request clarification of the Final Office Action's basis for rejecting these claims in the event that the current rejection is not withdrawn/reversed.

Turning to the obviousness rejection of claims 5-6, 10, 11, 15, 16, and 20, Appellants traverse the rejection for at least the reasons provided herein above with regard to independent claims 1 and 12 from which these claims depend. Furthermore, Appellants traverse the Office Action's assertion that Danisch discloses the recited wire twisting schemes in the context of a *sensor catheter* including bi-directional signal paths supported by the plurality of wires. In the event that the rejection is not withdrawn, Appellants request identification of a sensor catheter within the Danisch patent.

Conclusion

The combined disclosures of the Ferrera and Osadchy references neither disclose nor suggest a twisted wire bundling scheme wherein the signals on the twisted wires comprise both sensor signals and control signals. For this reason, as well as others stated herein above, the presently pending claims are patentable over the prior art presently known to Appellants. Appellants therefore request reversal of the presently pending rejection of claims 1-20.

Respectfully submitted,



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Claims Appendix

1. (Previously presented) A sensor catheter, comprising:

a catheter having proximal and distal ends, a proximal end of the catheter adapted to be coupled to a processing unit;

a sensor assembly disposed at the distal end of the catheter; and

a plurality of wires extending from the proximal end of the catheter to the distal end of the catheter, the plurality of wires coupled to the sensor assembly,

wherein the plurality of wires are divided into first and second wire bundles, each of the wires in the first and second wire bundles twisted together to reduce electromagnetic interference between the wires, and wherein the plurality of wires carry control signals transmitted to the sensor assembly and sensor signals transmitted from the sensor assembly.

2. (Original) The sensor catheter of claim 1 wherein the first and second wire bundles are twisted together and disposed within an outer sheath.

3. (Previously presented) The sensor catheter of claim 1 wherein the plurality of wires further are divided into a third wire bundle, each of the wires in the third wire bundle twisted together to reduce electromagnetic interference between the wire bundles.

4. (Previously presented) The sensor catheter of claim 1, wherein the first wire bundle consists of a pair of wires.

5. (Original) The sensor catheter of claim 4, wherein the pair of wires is twisted together in a clockwise direction.

6. (Original) The sensor catheter of claim 4, wherein the pair of wires is twisted together in a counter-clockwise direction.

7. (Previously presented) The sensor catheter of claim 1, wherein the second wire bundle consists of a pair of wires.

8. (Currently amended) The sensor catheter of claim 3, wherein the third bundle consists of three wires.

9. (Original) The sensor catheter of claim 3, wherein all three wire bundles are twisted together and disposed within an outer sheath.

10. (Original) The wiring arrangement of claim 1, wherein the wires in the first wire bundle are twisted together in a first direction and the wires in the second wire bundle are twisted together in a second, substantially opposite direction.

11. (Original) The wiring arrangement of claim 2, wherein the wires in the first wire bundle are twisted together in a first direction and the wires in the second wire bundle are twisted together in the first direction, and the first and second wire bundles are twisted together in a second direction substantially opposite to the first direction.

12. (Previously presented) A sensor catheter, comprising:

a flexible elongate member having proximal and distal ends, a proximal end of the flexible elongate member adapted to be coupled to a processing unit;

a sensor assembly disposed at the distal end of the flexible elongate member; and

a plurality of wires extending from the proximal end of the flexible elongate member to the distal end of the flexible elongate member, the plurality of wires coupled to the sensor assembly,

wherein the plurality of wires are divided into first and second wire bundles, each of the wires in the first and second wire bundles twisted together to reduce electromagnetic interference between wires in the first and second wire, and wherein the plurality of wires carry control signals transmitted to the sensor assembly and sensor signals transmitted from the sensor assembly.

13. (Original) The sensor catheter of claim 12 wherein the first and second wire bundles are twisted together and disposed within an outer sheath.

14. (Previously presented) The sensor catheter of claim 12 wherein the plurality of wires further are divided into a third wire bundle, and each of the wires in the third wire bundle are twisted together.

15. (Original) The sensor catheter of claim 12, wherein the wires in the first wire bundle are twisted together in a clockwise direction.

16. (Original) The sensor catheter of claim 15, wherein the wires in the second wire bundles are twisted together in a counter-clockwise direction.

17. (Previously presented) The sensor catheter of claim 12, wherein at least one of the first and second wire bundles consists of a pair of wires.

18. (Previously presented) The sensor catheter of claim 14, wherein the third wire bundle consists of three wires.

19. (Original) The sensor catheter of claim 14, wherein all three wire bundles are twisted together and disposed within an outer sheath.

20. (Original) The wiring arrangement of claim 12, wherein the wires in the first wire are twisted together in a first direction and the wires in the second wire bundle are twisted together in the first direction, and the first and second wire bundles are twisted together in a second direction substantially opposite to the first direction.

Evidence Appendix

NOT APPLICABLE

Related Proceedings Appendix

NOT APPLICABLE